

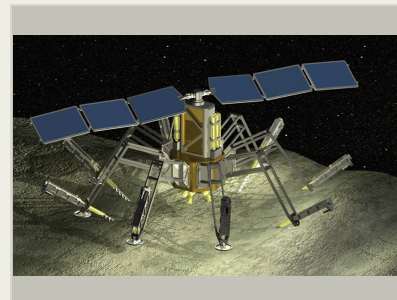
The World is Not Enough (WINE): Harvesting Local Resources for Eternal Exploration of Space, Phase I

Completed Technology Project (2015 - 2016)



Project Introduction

The paradigm of exploration is changing. Smaller, smarter, and more efficient systems are being developed that could do as well as large, expensive, and heavy systems in the past. The 'science' fiction becomes reality fueled by advances in computing, materials, and nano-technology. These new technologies found their way into CubeSats – a booming business in the 21st century. CubeSats are no longer restricted to aerospace companies. Universities and even High Schools can develop them. The World is Not Enough (WINE) is a new generation of CubeSats that take advantage of ISRU to explore space for ever. The WINE takes advantage of existing CubeSat technology and combines it with 3D printing technology and a water extraction system developed under NASA SBIR, called MISWE . 3D printing enables development of cold gas thrusters as well as tanks that fit perfectly within the available space within the CubeSat. The MISWE allows capture and extraction of water, and takes advantage of the heat generated by the CubeSat electronics system. The water is stored in a cold gas thruster's tank and used for propulsion. Thus, the system can use the water that it has just extracted for prospecting to refuel and fly to another location. This replenishing of propellants extends the mission by doing ISRU (living off the land) even during the prospecting phase. In Phase 1, we plan to test and investigate critical technologies such as (1) sample acquisition, (2) volatiles capture, and (3) 3D-printed cold gas thrusters that use water vapor including the organic and particulate contaminants that are inevitable during the early stages of asteroid mining. The engine is similar to a Solar Thermal Engine but scaled for a CubeSat. In Phase 2, we propose to develop a testbed of the critical systems and to demonstrate these onboard the International Space Station (ISS).

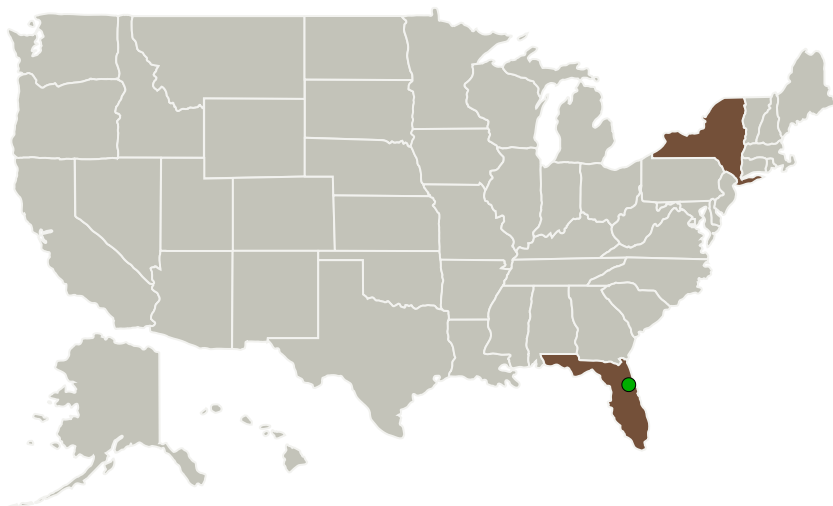


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Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations

Florida	New York
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Project Transitions

▶ **June 2015:** Project Start

✓ **June 2016:** Closed out

Closeout Summary: The World is Not Enough (WINE): Harvesting Local Resources for Eternal Exploration of Space, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/140805>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Honeybee Robotics, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

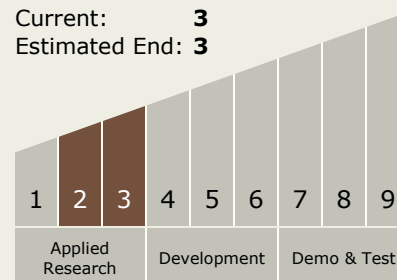
Carlos Torrez

Principal Investigator:

Philip T Metzger

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3

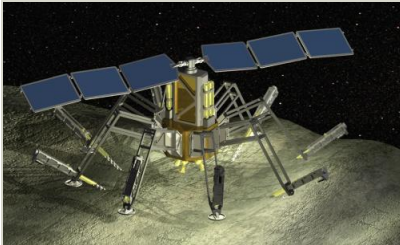


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Images



Briefing Chart Image

The World is Not Enough (WINE):
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I

(<https://techport.nasa.gov/image/128420>)

Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.1 In-Situ Resource Utilization
 - └ TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System